EUROPEAN UNION and AFRICAN, CARIBBEAN, and PACIFIC COUNTRIES ECONOMIC PARTNERSHIP AGREEMENTS and their IMPLICATIONS on the AGRILCTURAL TRADE of the SUDAN

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Abstract:

The objective of this paper is to assess the potential implications of the Sudan signing of the Economic Partnership Agreement between the European Union and African, Caribbean, and Pacific Countries (EPA) on the Sudan agricultural trade relationships. More specifically it attempts to estimate effects of the EPA on production, demand, and trade of agricultural commodities of the Sudan domestically and abroad. A multimarket model with Armington specification is applied to achieve the paper objectives. The model is based on the average data of years 2014 and 2015 for the main agricultural exports of Sudan to the EU, namely gum Arabic, sesame, cotton and groundnuts. The model results revealed that, removal of tariffs on these agricultural commodities by the EU resulted in an increase of the export of cotton, sesame, groundnuts and gum Arabic by 92%, 150%, 154% and 110%, respectively and a decrease their exports to the rest of the world. This may be attributed to the increase of the EU consumers demand for these products in response to the reduction of their prices after application of zero tariffs. The net result for Sudan is the increase in aggregate output of agricultural production and improvement in foreign exchange earnings with slight negative impact on domestic demand. While it showed an improvement in the producer surplus, consumer surplus and net welfare in some case. The simulation results of the zero tariff show negative impacts on the domestic producer and consumer prices, this lead to reduction in domestic production, and increases the domestic demand.

Keywords: Consumer's surplus, Producer's surplus, welfare, tariff trade

INTRODUCTION

Trade Agreements between the African, Caribbean, and Pacific (ACP) countries and European Union (EU) countries, started in 1963 when they signed Yaoundé I Agreement, followed by Yaoundé II in 1969, and Yaoundé III in 1973. In 1975 they signed Lome I Agreement followed by Lome II in 1980, Lome III in 1985 and Lome IV in 1990. In 2000 the Cotonou Partnership Agreement (CPA) was signed. The key principles of the CPA are reciprocity, differentiation, deeper regional integration, and coordination of trade and aid.

The CPA has adopted the Economic Partnership Agreement (EPA) as the new framework for economic cooperation. The primary aim of this cooperation is to contribute to the development of trade regimes that promotes sustainable development and the integration of ACP countries into the world-economy (Ministry of Foreign Trade, 2007). The trade agreements between the EU and ACP countries started by relatively few countries in 1963,

but in 2007, 27 European countries and 79 ACP countries were involved in the cooperation. Lomé Agreements I, II and III concentrated on the economic cooperation, but in Lomé IV and Cotonou Agreements, human rights, democracy and governance, implementation of law and other political issues were added to the agreements (Ministry of Foreign Trade, Sudan 2008).

Sudan may face challenges that will be imposed on its economy by the implementation of the EPA with the EU. Some of these challenges may include expected losses of fiscal revenue due to elimination of tariffs, expected increase in competition with EU as a result of reciprocity of trade benefits included in the EPA, and limited capacity of Sudanese negotiators in dealing with different components of the EPA(Ministry of Foreign Trade, Sudan 2008).

Problem statement:

The economy of Sudan is characterized with high dependence on agriculture. Agriculture represents the main source of employment and income for the majority of the population, and a major source of government revenue. Agricultural exports are considered to be the major source of foreign exchange earnings of the country (World Bank, 2007).

The EU countries occupied a position on the customers list of Sudan's agricultural exports and imports. The major items exported to the EU include raw materials, particularly cotton, gum Arabic, sesame and groundnuts. Major Sudan's imports from the EU countries include machineries and capital equipment, manufactured goods, means of transports, chemicals, foodstuffs, textiles and other materials. The EPA is expected have positive effect on agricultural exports of the Sudan as market access to the EU market is expected to improve after the EPA. On the other hand, the opening of Sudanese markets for the EU commodities is expected to have no significant effect on agricultural trade of Sudan because the imports from the EU are mainly in the form of capital goods that have no competing impacts for Sudan major agricultural commodities. Trade plays an important role in Sudan economy. Sudan implemented different development strategies and various reform programs that targeted the increase of exports of agricultural commodities which are the main exports items. Liberalization and privatization policies are the main instruments adopted to enhance production and export of agricultural products and economic growth (Ministry of Agricultural and Forestry, Sudan 2008).

Objectives of the study

The general objective of this paper is to assess the potential implications of signing the Economic Partnership Agreement (EPA) with the EU on the Sudan agricultural trade relationship. With the following specific objectives:

1. To estimate the EPA effects on agricultural trade of Sudan with the EU and the rest of the world.
2. To estimate the potentials impact of EPA on domestic production and consumption of agricultural commodities of the Sudan.
3. To estimate the impact of EPA on producers and consumers surplus in the Sudan.

Research methodology

Data sources:

To achieve the objectives of the study, secondary data was obtained on the average quantities and prices, production, domestic consumption and export of the major exports of the agricultural products of the Sudan for 2004 – 2014. The major agricultural export crops of the Sudan, cotton, sesame, gum Arabic, groundnut. The data sources including the Department of Agricultural Economics and Statistics of the Ministry of Agriculture and Forestry, the Ministry of Finance and Economic Planning, the Central Bank of Sudan, the Custom Administration, Sudan Custom Police, Department of the Economic Partnership Agreement (EPA) of the Ministry of Foreign Trade and other relevant sources.

Analytical techniques

Armington model was applied to achieve the study objectives. Armington model is a useful tool in analyzing a number of various agricultural and international trade issues. The model introduces products differentiation and gains from trade in consuming differentiated products. It assumes that final goods internationally traded are differentiated on the basis of the country of origin .The general nature of the Armington model allows for simultaneous determination of supply, demand, producers and consumers surplus, welfare, for all commodities under the study (Lioyd and Zhang, 2006). Border prices used in the model are the export unit value. Also, the elasticity used in the equation is obtained from the previous studies. The models cover major agricultural exports of the Sudan to the EU namely, gum Arabic, sesame, cotton and groundnuts.

Specification of the Armington model

One of the assumptions of the original Armington model is product homogeneity, which is not consistent with problem at hand, where product differentiation exist (heterogeneity). To solve this problem is done by incorporating Armington assumption (CES)[1] and constant elasticity of substitutions (CET). In the modified model the agricultural trade between Sudan, other s countries and the rest of the world are modeled.

Armington model can be specified as a system of non- linear equations. First the Armington composite good (q_d) can be defined as a constant elasticity of substitution (CES) composite of domestic good and of imports from other countries.

$$q_d = \left[\sum_{i=1}^{n} \alpha_i X_i^{\rho} \right]^{1/\rho}$$

Where $X_{i,}$ is domestic good if i =1 and is for imports if i = 2….n,

ρ is CES activity function exponent,

$\rho = 1 - \left(\frac{1}{\sigma} \right)$, σ is the elasticity of substitution (CES)

α_i is the CES weight of good i .

$$\alpha_i = \left[\frac{X_i}{k} \right]^{(1/\sigma)}$$

Where, k is the calibrated constant.

[1] The procedure followed by Francois, J. and Hall (1997) is applied.

The model is calibrated by scaling the quantities so that internal prices are all unity in the benchmark. This includes the price for Armington composite good (P). The price index for the composite good can be shown to equal:

$$P = \left[\sum_{i=1}^{n} \alpha_i^{\sigma} P_i^{1-\sigma} \right]^{1-1/\rho}$$

Where P_i is the calibrated domestic product market price if i =1 and is the calibrated internal price for imports if i = 2….n.

At the same time, from the first order conditions, the demand for good X_i is equal to:

$$X_i = \left[\frac{\alpha_i}{P_i} \right]^{\sigma} \left[\sum_{i=1}^{n} \alpha_i P_i^{1-\sigma} \right]^{-1} Y$$

$$= \left[\frac{\alpha_i}{P_i} \right]^{\sigma} P^{\sigma-1} Y \qquad \text{, where Y is the total expenditure } (Y = P\, q_d)$$

The supply function of the composite good (q_s) can be specified as:

$$q_s = k_s P^{1-\varepsilon_s}$$

Where ε_s is the elasticity of supply for composite good.

The supply of domestic good (X_{si}) is presented by the following equations:

$$X_{si} = K_{si} P_i^{\varepsilon_{is}}$$

The equation is extended to include trade measures (tariff) to represent the import supply equation as follows:

$$X_{si} = k_{si} \left[\frac{P_i}{(1+t_j)} \right]^{\varepsilon_{si}}$$

Where $X_{si,}$ is the domestic supply if i =1 and is for imports supply if i = 2….n,

ε_{si} is the elasticity of supply for domestic good if i =1 and is for imports if i = 2….n,

While t, is the tariff rate and k_{si} is the calibrated constant.

Welfare analysis

The concept of consumer and producer surplus has been employed to evaluate the sign and magnitude of welfare effects associated with policy changes. Once we solve the system of equations defined above, we use composite prices for consumers and produces based on a CES and CET price index to calculate consumer and producer surplus. Gain and losses to producers from price changes are measured as changes in producer surplus. Likewise, consumer gain or losses can be measured as changes in consumer surplus (Loo and Tower, 1990; Jechlitschka, 1997).

Producer surplus

The producer surplus (PS) is the area between the supply curve and equilibrium price line. It is equal to the gross revenue (R_i) minus total variable cost (TVC_i) and it is represented by:

$$PS = R_i - TVC_i,$$

Where: Where, $R_i = P.q_s$ and

$$TVC_i = Pq_s - \int_0^P q_s(p)dp = Pq_s - \frac{1}{\varepsilon_s + 1} k_s P^{\varepsilon_s + 1}$$

Consumer surplus

The consumer surplus (CS) is the area between demand curve and equilibrium price line. It can be measured by the difference between marginal utility, which indicates the maximum price which consumers would be willing to pay for that unit, and the price actually paid (Sadoulet *et al*., 1995) and it is represented by:

$$CS = B_i - Y$$

Where, $Y = P.q_d$

And

$$B_i = P.q_d + \int_0^P q_d(p)dp = P.q_d + \frac{k}{\varepsilon_d + 1}(u^{\varepsilon_d + 1} - P^{\varepsilon_d + 1})$$

Where, B_i , Y and u are benefit, expenditure and maximum price respectively.

Finally, the net welfare (W) is derived by the sum of producer surplus, consumer surplus and tariff revenue (TR) in the case of CES function and it is represented by the follows:

$$W = PS + CS + TR$$

The tariff revenue is represented by the following equation:

$$TR = \sum_i^n X_{si}(P_i - P_w)$$

Where i= 2……n. and P_w is the world price.

In the case of the CET function the net welfare is represented by the following equation:

$$W = B_i - TVC_i + F$$

Where F is the foreign exchange earnings, and it is represented by the following equation;

$$F = \sum_i^n X_{si}(P_w(1 - t_i)$$

Where I= 2……n. and t_i is the tariff rate.

Solving the model:

The excel solver used to solve the model as an optimization or programming model. In the solver, one of the equation cells is specified as target cell and others as constraints. When the objectives function is solved for zero value, the model generates optimal values for

all prices and factors of production, consumption and outputs of commodities included in the model at the point where the market is in equilibrium. These values represent the production and consumption levels of the economy modeled (Armington, 1969).

RESULTS AND DISCUSSION

The average production, domestic consumption, and exports quantities of the 2014 and 2015 are presented in table (1) .these figures shows the situation before applying zero tariff on the import of products by the EU. The tariff imposed on the products was 20% of their value (table1).

Table 1: Percentage Changes of Quantities for the selected Agricultural Commodities

Item	Cotton	Sesame	Gum Arabic	Groundnut
Aggregate output	-5	-1	-3	-2
Domestic demand	15	1	8	6
Export to the EU	-29	-20	-10	-13
Export to ROW	26	3	15	11
Total exports	1	-10	-8	-6

Source: Model results

An EPA zero tariff scenario is developed to evaluate changes in production, prices, net welfare of agricultural exports (cotton, gum Arabic, sesame and groundnuts). The agricultural exports are only considered in this study because the imports from the EU are mainly non-agricultural products (Ministry of Agriculture and Forestry, Sudan 2008).

In general, implementation of zero tariff would expected to have a positive impact on individuals countries through: (i) changes in the region trading policy environment as a result of implementing zero tariff by all members of the ACP countries; (ii) and changes in the domestic policy environment of the country itself.

The model results reveal that removal of tariff after application of the EPA resulted in export increase of cotton, sesame, groundnuts and gum Arabic by 92%, 150%, 154% and 110% respectively from Sudan to the EU as expected, while exports to rest of the world (ROW) decreased (table 2).

Table 2: Percentage Changes of Quantities for the selected Agricultural Commodities

Item	Cotton	Sesame	Gum Arabic	Groundnut
Aggregate output	1	106	103.4	1
Domestic demand	-6	-125	-76	-12
Export to the EU	92	150	110	154
Export to ROW	-4	-85.5	-82	-23.3
Total exports	9.7	109	103	2

Source: Model results

The increase in agricultural exports of Sudan to the EU is attributed mainly to the decrease in the EU internal prices facing Sudanese exports after application of zero tariffs (table 3).

Table 3: Percentage Changes of Prices for the Selected Agricultural Commodities

Item	Cotton	Sesame	Gum Arabic	Groundnut
Aggregate output	-1	-163	-65	-53.7
Domestic demand	-48	-77	-87	-29.4
Export to the EU	17	28	-33	-238
Export to ROW	176	188	28	215
Total exports	9.7	109	103	2

Source: Model results

Cotton and sesame recorded the highest response which may reflect a high comparative advantage of Sudan in these two commodities. The aggregate output level for the concerned commodities increased due to increase in their export levels.

The increase of agricultural exports to the EU, increase the foreign exchange earnings and aggregate output of the covered commodities while the domestic demand is forced to decrease in response to higher export demand. Therefore, the welfare of agricultural export producers is expected to improve, and the consumer welfare is slightly decreased as shown in (table 4). The end result is small loss in net welfare for cotton, sesame and gum Arabic. In case of groundnut there is an increase in consumer surplus leading to increase the net welfare.

Table 4: Percentage Changes of Welfare Indicators for the Selected Agricultural Commodities

Item	Cotton	Sesame	Gum Arabic	Groundnut
Aggregate output	102	102	101	188
Domestic demand	-1	-96.5	92	11.3
Export to the EU	71	73.6	-12	11
Export to ROW	-95	-9.6	-58.5	17.6

Source: Model results

CONCLUSION

The agricultural sector is a leading sector in the Sudanese economy, the importance of the agriculture sector is being the main source of income for the majority of population. Sudanese economy is based largely on agriculture as a source of non-petroleum foreign exchange earnings, so agricultural exports are considered to be the major source of foreign exchange earnings after petroleum products since 1999.

The paper results showed clearly that application of the EPA has positive impacts on Sudan's agricultural aggregate output, exports and foreign exchange earnings. Also, the implementation of the EPA will redirect agricultural exports of Sudan towards the EU markets, and this will impose more pressures on quality assurance and standards in order to comply with the EU market regulation. Therefore, in order to maximize the benefits from the

EPA Sudan must increase investments, design and implement more effective policies in agricultural sector to raise productivity, improve quality and competitiveness. Also, Sudan need to take care of expected negative impacts of the EPA on the domestic markets.

REFERENCES

Armington, P.S. (1969). A theory of demand for products distinguished by place of production. International Monetary Fund Staff Papers, Vol. 16, pp. 159-176.

Lioyd, P.J. and Zhang, X.G. (2006). The Armington Model. Communission Staff Working paper, Melbourne.

Loo, T. and Tower, E. (1990). Agricultural liberalization, welfare, revenue and nutrition in developing countries. In agricultural trade liberalization implication for develoing countries. Edited by I. Goldin and O. Knudsen Paris: OECD and World Bank Proceedings, 2: 85-89.

Francois, J. and Reinert, K. (1997) Applied Methods for Trade Policy Analysis. A Handbook, published by Cambridge University Press, United Kingdom.

Ministry of Agriculture and Forestry (2008). Department of Agricultural Economics Year book of Agricultural Statistic, Khartoum, Sudan.

Ministry of Foreign Trade (2007). Report about note on the state of play in the EPA's negotiations, Brussels, 20 December, 2007.

Ministry of Foreign Trade, (2008). Economic Partnership Agreement (EPA) between the EU and ACP countries.

Jechlitschka, K., und Lotze, H. (1997). Theorie und Anwendung eines Mehr-Market-Modells Zur sektoralen Analyse Von Agrapolitiken fuer Agrarinformatik.

Sadoulet, F. and Janvery, A. (1995). Quantitative development policy analysis. John Hopkins University Pres, Baltimore and London.

World Bank (2007). Sudan country brief. World Bank, Washington, DC, USA.